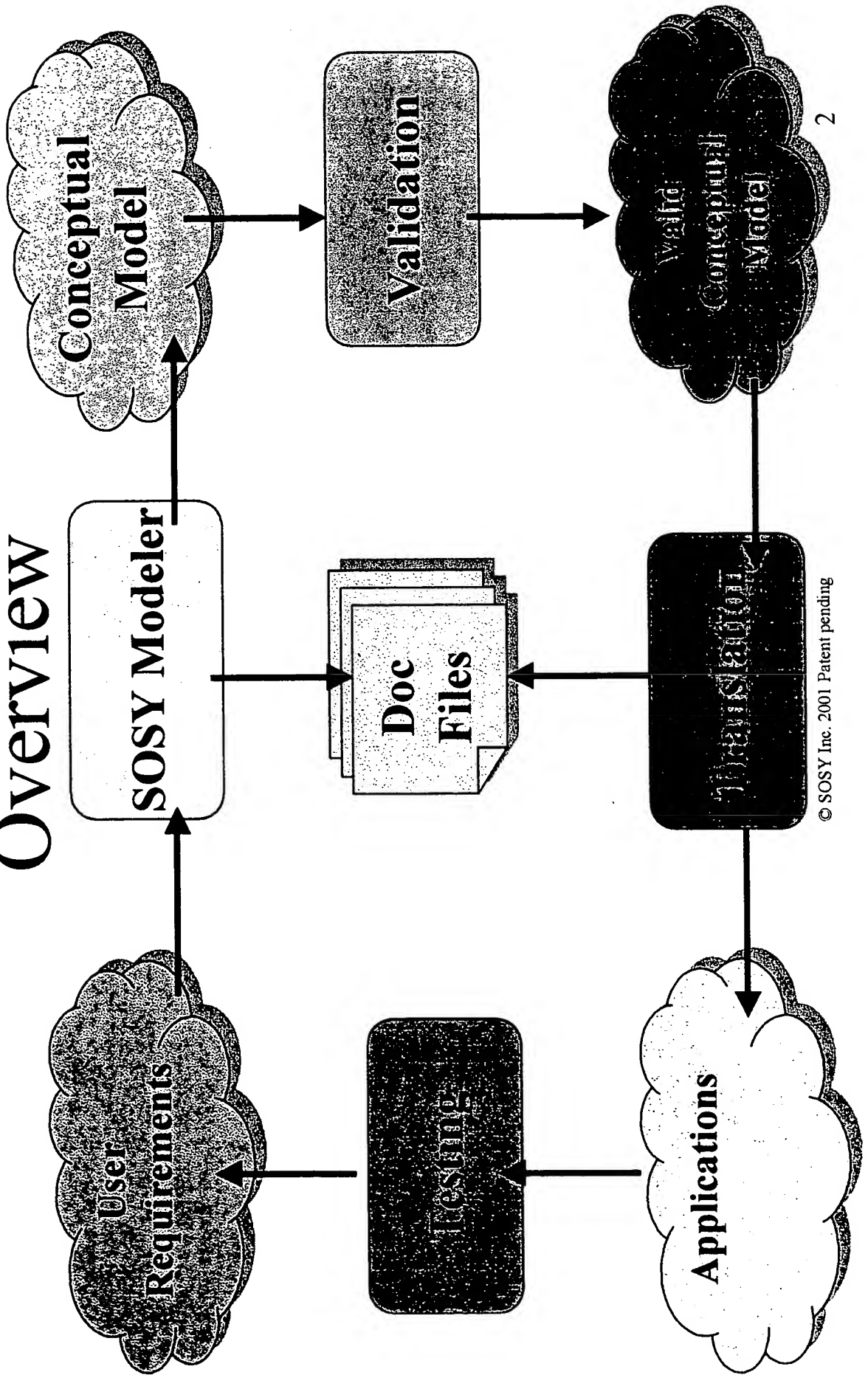


Summary

- Modelling
- Validation
- Documentation
- Persistence
- Business Logic
- User Interface

Overview



Conceptual Modeling Phase

CARE Technologies, S.A.

Index

- Intro
- Overview
- Phase 0. Requirements elicitation.
- Phase 1. Classes identification.
- Phase 2. Relationships between classes.
- Phase 3. Filling classes' details.

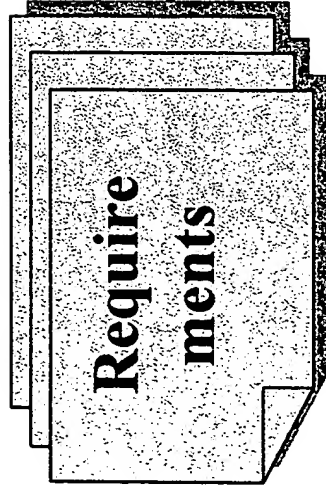
Index

- Phase 4. Express evaluations.
- Phase 5. Agent relationships.
- Phase 6. State Transition Diagram.
- Phase 7. Presentation Model.

Intro

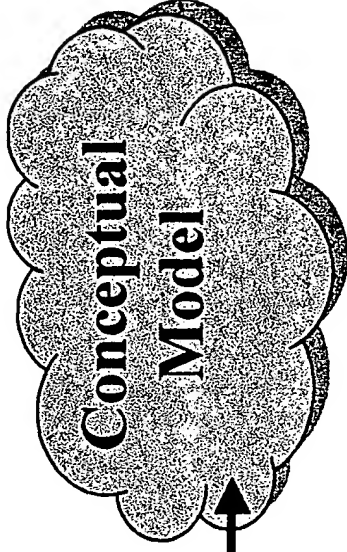
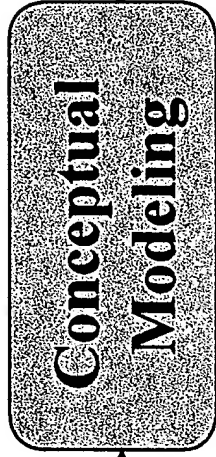
- Conceptual Modeling Phase is a process of systematically & precisely description of the system to build, using:
 - Graphical UML compliant diagrams.
 - Constrains and semantics in a formal non-ambiguous language.
 - This phase is assisted by an integrated Modeler tool.

Overview



Requirements

- Specifications
- Documents
- Interviews
- Reports
- Other info. sources



Conceptual Model

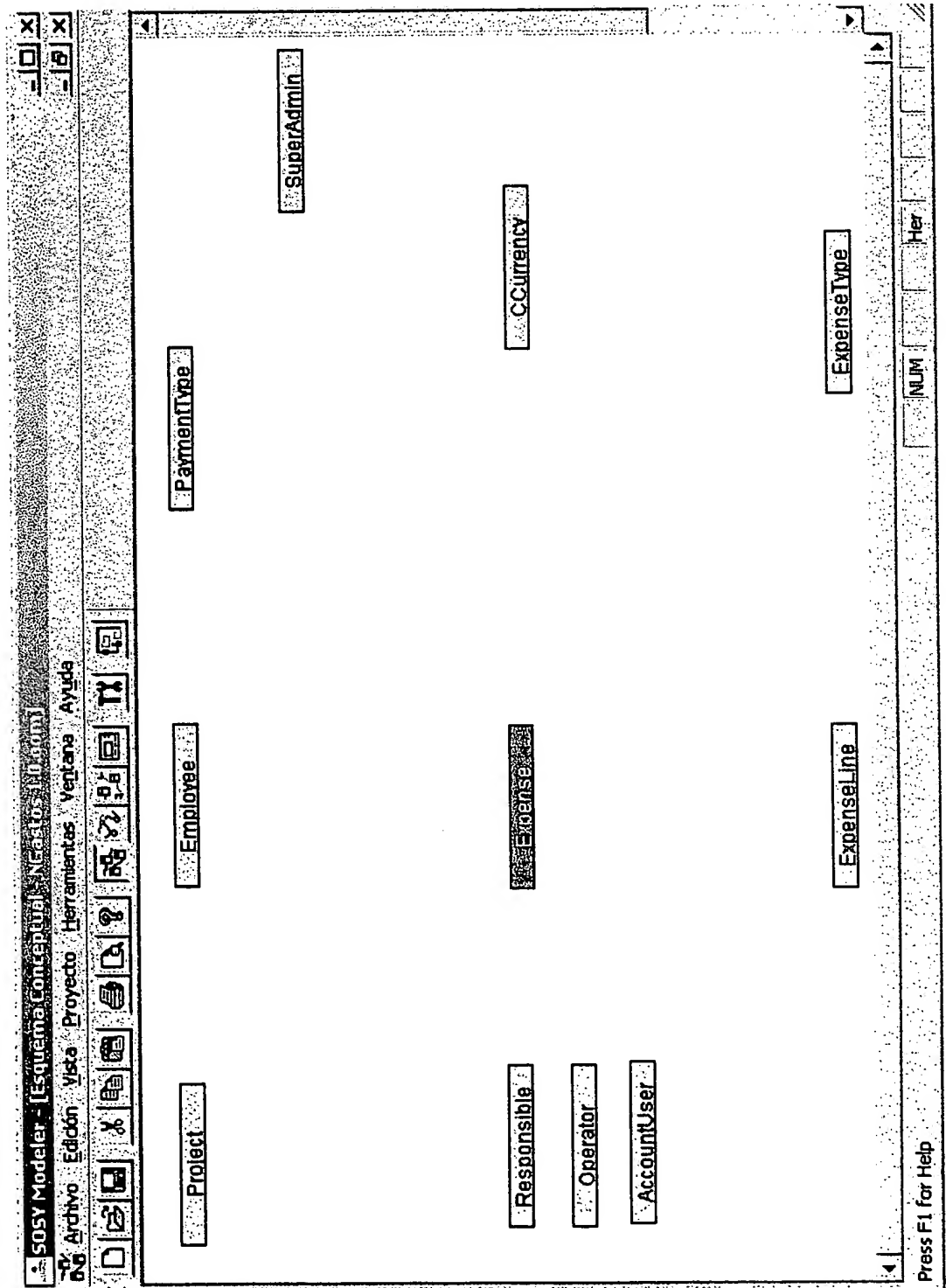
- Classes
- Relationships
- Attributes
- Services
- ...

Expressed in a non-ambiguous language.

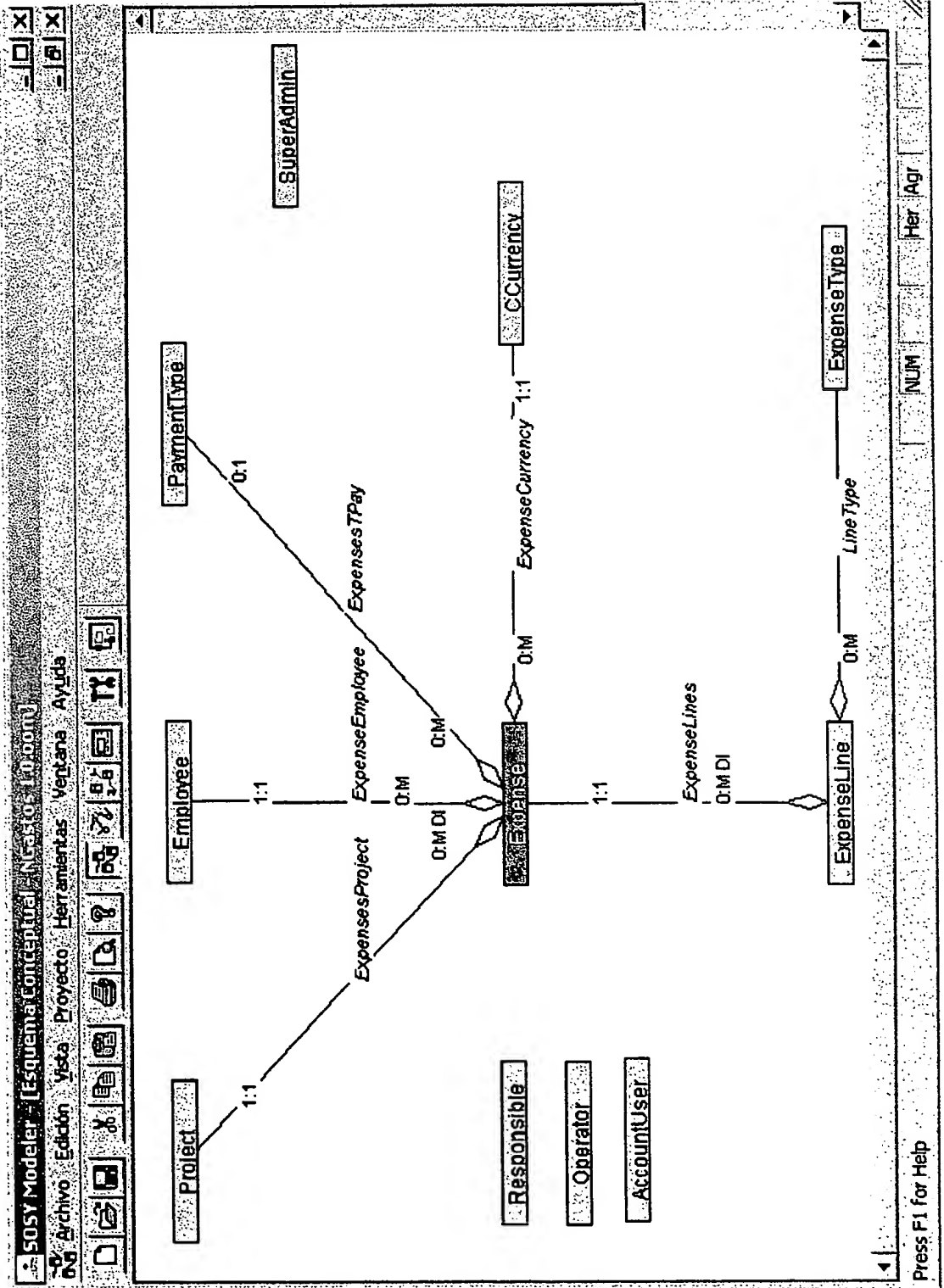
Phase 0. Requirement elicitation.

- Gathering the system requirements.
 - By meetings & interviews with customers, experts and final users.
 - By collecting reports, or documents expressing the system how-to and using tools.
 - Obtaining a coherent set of information as input to the next phase.

Phase 1. Classes identification.



Phase 2. Relationships between classes.



Phase 3. Filling classes' details.

Clase: **Expense**

Eventos y Transacciones

Nombre	Características
newexpense	New
delexpense	Destroy
modify	
close	
authorize	
approve	
pay	
rejectautho	
rejectpayment	
insPaymentType	Shared with PaymentType
borPaymentType	Shared with PaymentType
DELETEALL	Tran
TPAY	Tran

Parámetros

Nombre	Tipo dato
p_thisExpense	Expense
p_Cause	String
p_Advances	Real
p_Exchange	Real

Arbitros

Nombre	Tipo dato
Nombre	
Tamaño	<input type="checkbox"/> Nulos <input type="checkbox"/> Colección
Alias	
Valor por defecto	
Observaciones	

Servicios

Nombre	Características
modify	
Alias	
Mensaje de Ayuda	Allows to edit some data of ar
Observaciones	

☐ Transacción
☐ New ☐ Destroy
☐ Uso interno

Phase 3. Filling classes' details.

Clase: [Expense] [v]

Acción: [Expense] [v]

Transacción: [DELETEALL] [v]

Fórmula: [FOR ALL Lines DO Lines.deleteLine(Lines). deleteExpense(THIS)]

Acción: [Expense] [v]

Clase/Rol: [Expense] [v]

Agentes: [Expense] [v]

Servicio: [Expense] [v]

Parámetros: [Expense] [v]

Inicializar: [Expense] [v]

Observaciones: [Expense] [v]

Detalles: [Expense] [v]

Crear y acción

Clase: [Expense] [v]

Aceptar Cancelar

Phase 4. Express evaluations.

Modelo Funcional

Clase: Atributo:

Evento	Efecto	Condición
modify	p_Cause	

Categoría: ☐ Cardinal ☒ De Estado ☐ De Situación

Detalles de Evaluación

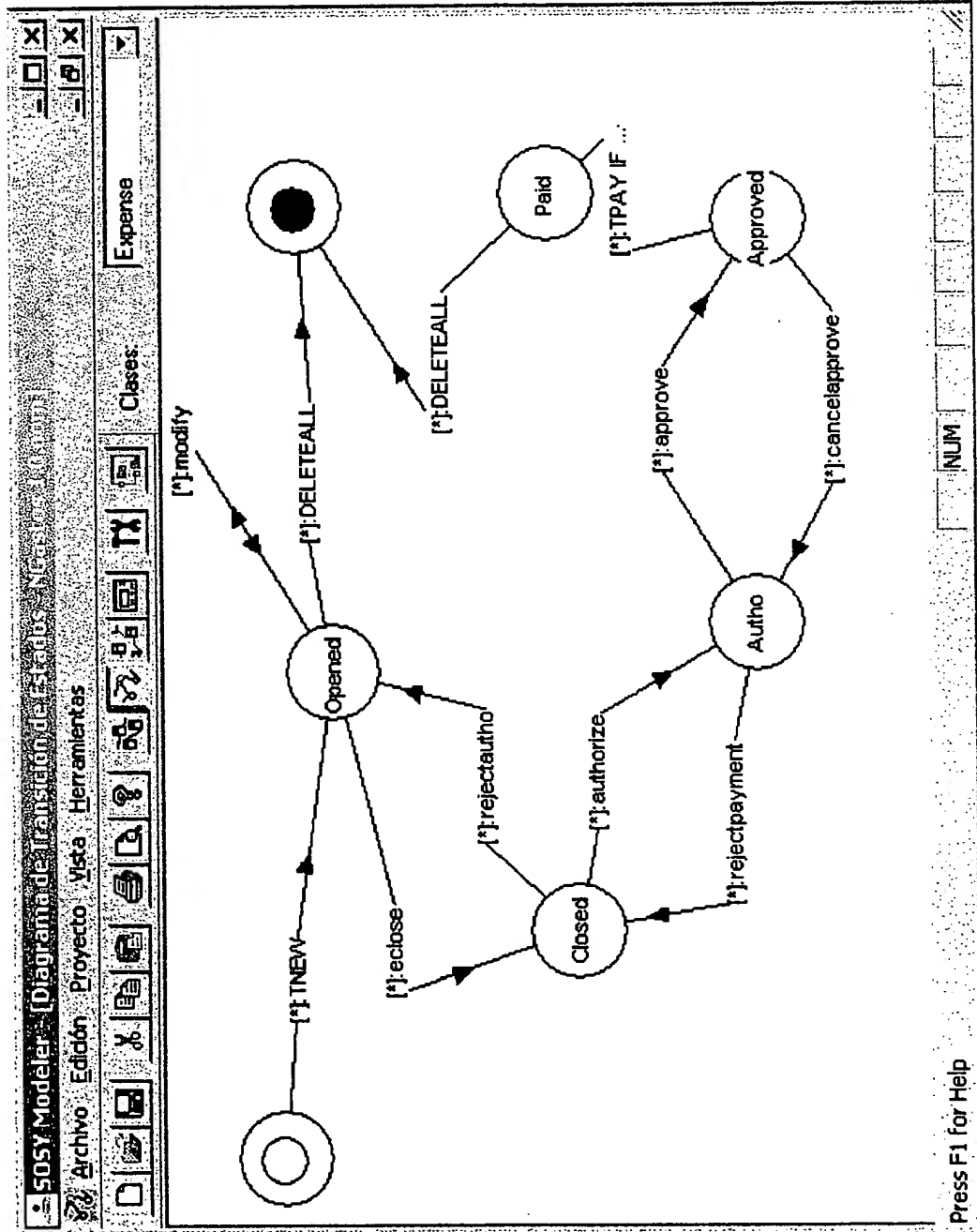
Evento:

☐ Inferir para el resto de atributos

Condición de evaluación:
IF:

Efecto del evento:
p_Cause

Phase 6. State Transition Diagram.



[illegible]

APPENDIX A

Phase 7. Presentation Model.

Conjunto de Visualización

Nombre: CV_Expense

Limpiar

Borrar

Atributos a visualizar:

Atributo	Tipo dato
Project.ProjectName	String
Employee.EmpName	String
Employee.EmpSur...	String
Status	Int
AuthoDate	Date
PaymentDate	Date
TotExpenses	Real
Balance	Real

Atributos:

Atributo	Tipo dato
Cause	String
AuthoDate	Date
AuthoComments	String
PaymentDate	Date
PayComments	String
TotExpenses	Real
TotExpensesCur	Real
Advances	Real
AdvancesCur	Real
Exchange	Real
Balance	Real
BalanceCur	Real

<< Añadir

Eliminar >>

Subir

Bajar

Agregar

Aceptar

Cancelar

Clase: Expense

Phase 7. Presentation Model.

Filtro

flt_Expense

Alias:

Expense Reports

Borrar

Fórmula:

Project = vf_Project AND Employee = vf_Employee AND PresentDate >= vf_DateIniIssue AND PresentDate <= vf_DateEndIssue AND AuthoDate >= vf_DateIniApp AND AuthoDate <= vf_DateEndApp AND PaymentDate >= vf_DateIniPay AND PaymentDate <= vf_DateEndPay AND

<< Variable

Observ.

Variables

Nombre	Alias	Tipo dato	Tipo estilo	Estilo	Nueva	Modificar	Borrar
vf_Project	Project	Project	Sel. Población				
vf_Employee	Employee	Employee	Sel. Población				
vf_DateIniIssue	Initial Issuing Date	Date					
vf_DateEndIssue	Final Issuing Date	Date					
vf_DateIniApp	Initial Approving D	Date					

Tipo

Simple

Objeto-valuado

Nombre:

Estilo de introd.

Alias:

Estilo de selección:

Tipo de dato:

Clase: Expense

Aceptar

Cancelar

Conceptual Model Validation

CARE Technologies, S.A.

Index

- Intro
- Overview
- Validation Degrees
 - Partial Validation
 - Total Validation

Index

- Validation Types
 - Elements of the Conceptual Model
 - Formulas of the Conceptual Model (Syntax)
- Validation Trees
 - Nodes
 - Leaves
- Example

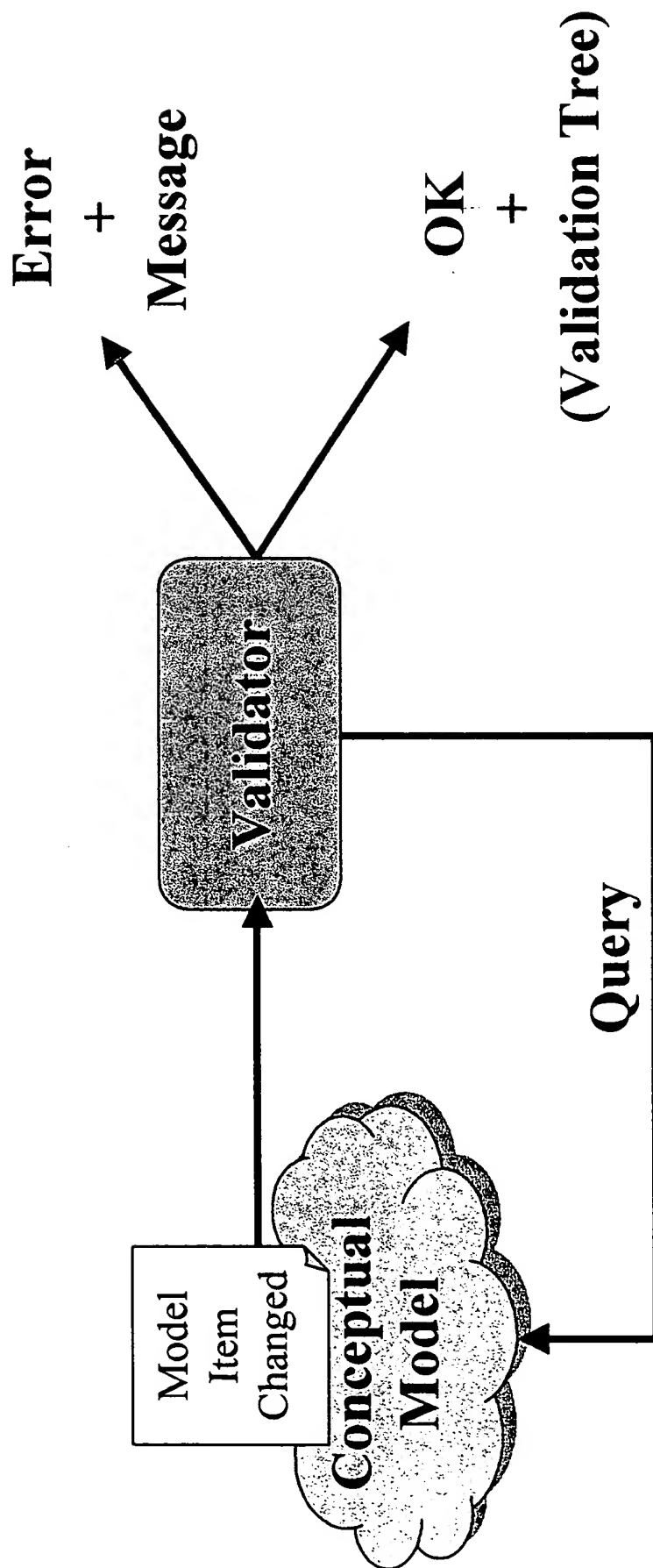
Intro

- Conceptual Model Validation is the process by which a conceptual model or a modification of it is proven to be valid:
 - Correct
 - Non Ambiguous
 - Non Contradictory
 - Complete
 - Every concept is fully specified
- Validation process checks the representation of requirements in Formal Specification Language to be valid

Validation Degrees

- Partial Validation
 - That of a single element of the Conceptual Model.
 - Happens whenever an element is added, modified or deleted.

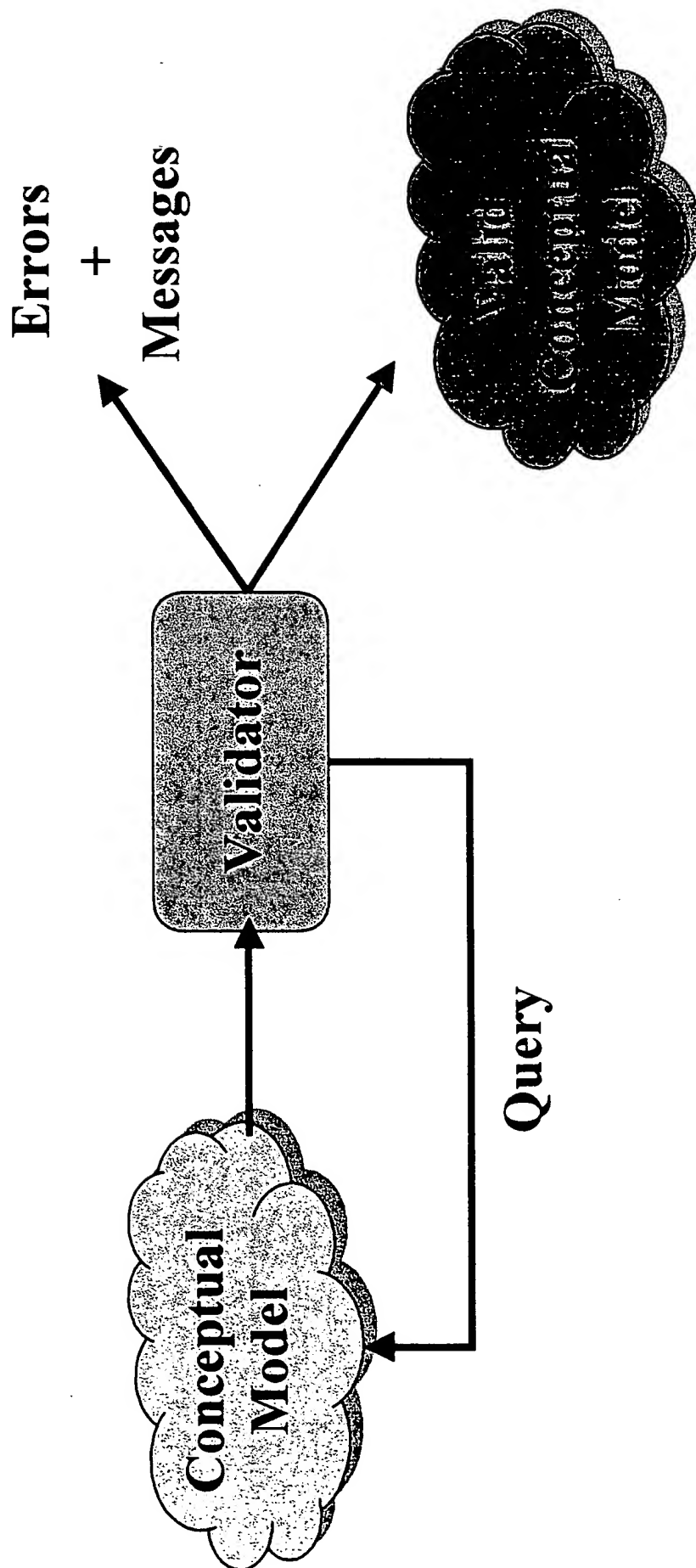
Partial Validation Overview



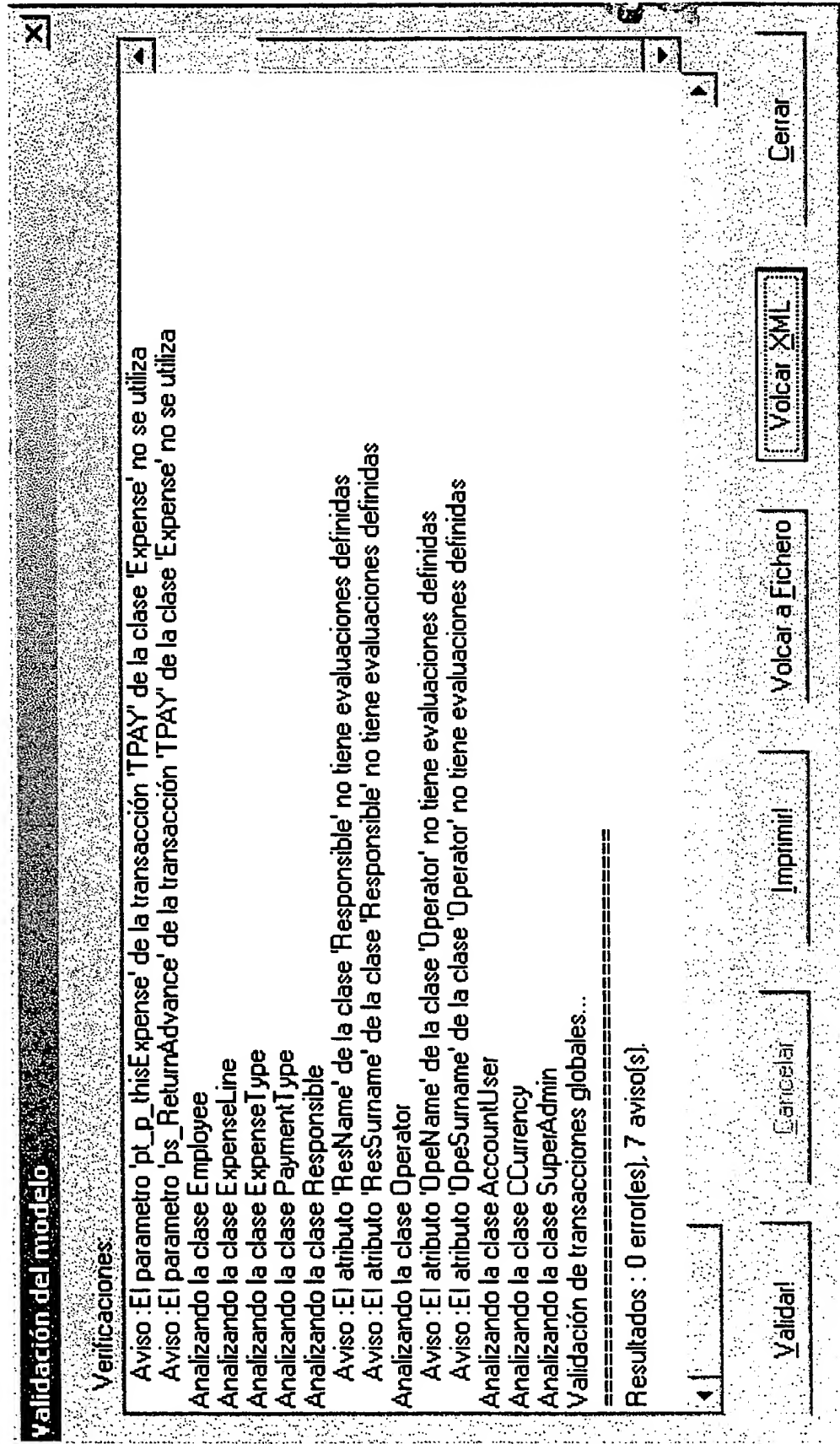
Validation Degrees

- Total Validation
 - That of the whole Conceptual Model.
 - Happens by request.
 - Must happen prior to any translation process.
 - Takes advantage of partial validations already performed.

Total Validation Overview



Total Validation Example



Validation Types

- Elements of the Conceptual Model
 - Ensure the properties of an element (except formulas) are correct and complete.
 - Conditions that must hold depend on the type of element and the property being validated.
 - Examples:
 - Class Name is unique in a Conceptual Model.
 - Attribute Name is unique in its Class (but not in a Conceptual Model)

Validation Types

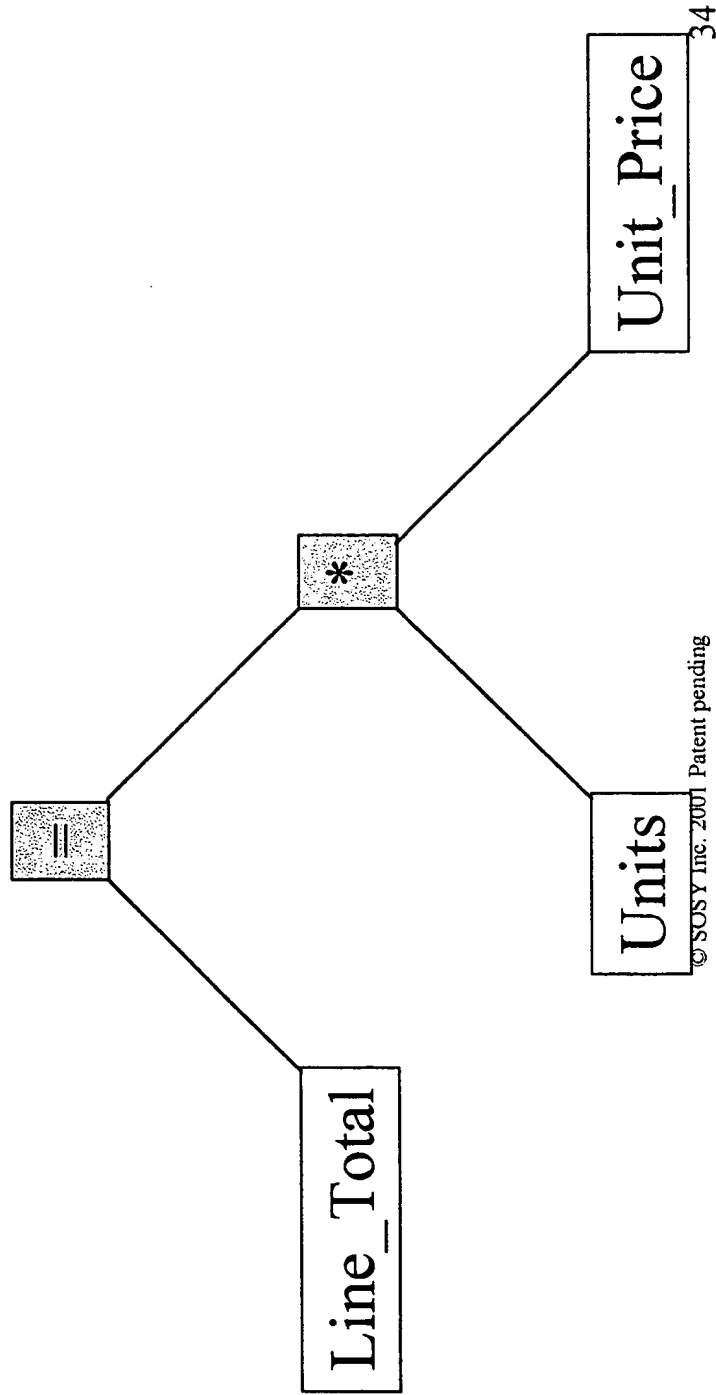
- Formulas of the Conceptual Model
 - Ensure the formulas of the Conceptual Model are correct and complete.
 - Syntactical and Semantical Validation according to an extended Formal Specification Language grammar.
 - Input:
 - Formula expression
 - Formula Type (precondition, valuation, ...etc.)
 - Formula Context (class name, service name, ...etc.)
 - Output:
 - Error Message (validation did not pass)
 - Validation Tree (validation passed)

Validation Trees

- Binary Tree representation of a correct formula.
- Tree consists of Nodes and Leaves.
- Nodes
 - Represent operators
 - Can have one or two “branches” (binary)
 - Branches can again be nodes or leaves
- Leaves
 - Represent operands
 - Have no branches

Example

- $\text{Line_Total} = \text{Units} * \text{Unit_Price}$



Documentation Translation

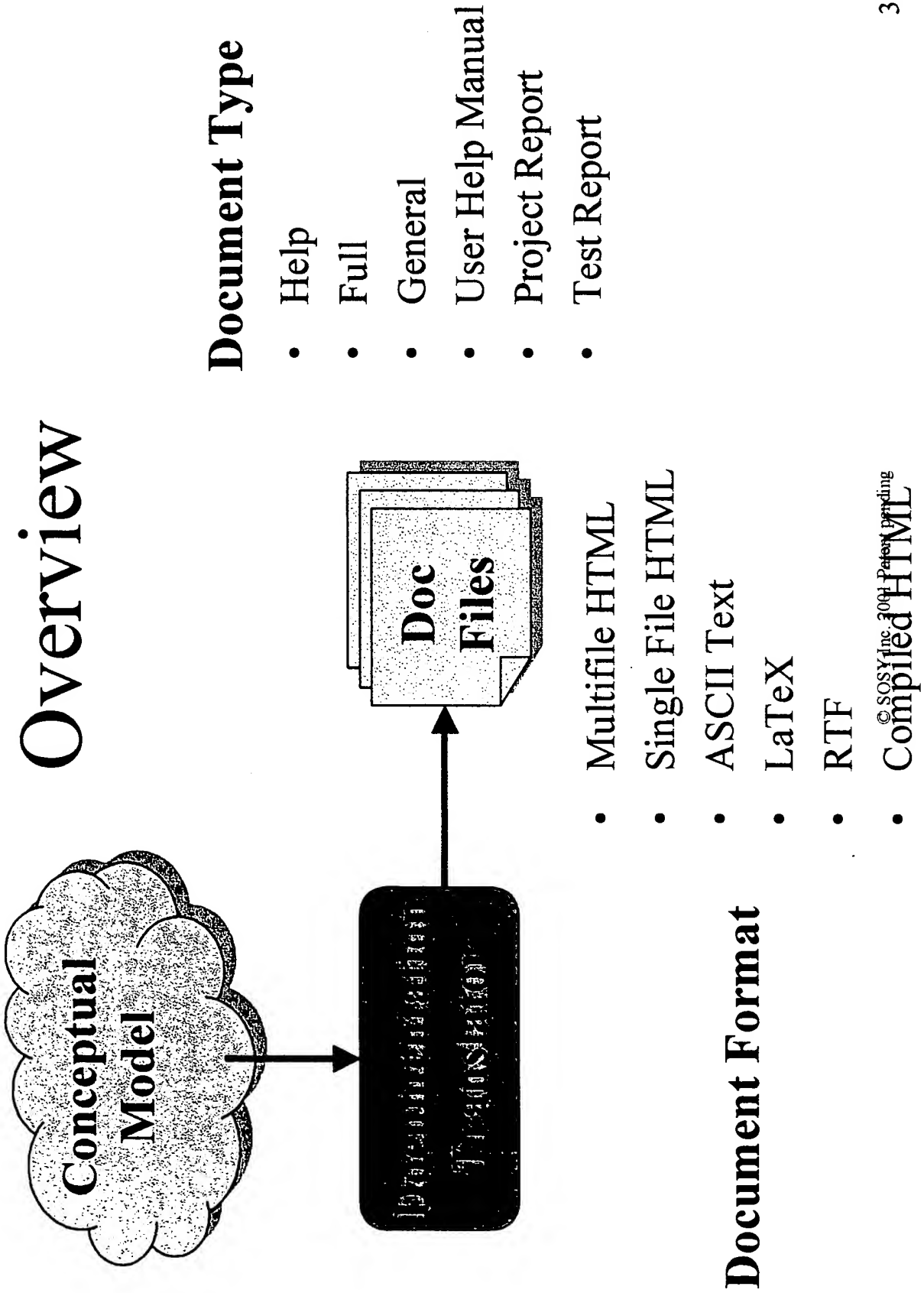
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Index

- Intro
- Overview
- Output Detail
 - Document Types
 - Document Formats
- Translation
 - CM Subset of Interest
 - Translation Process
 - Remarks
- Example

Intro

- Documentation Translation is the process to obtain, from a Conceptual Model, documentation on the system it represents.
- Documentation can have several degrees of detail and be focused on different aspects, thus obtaining different documentation formats from the same Conceptual Model.



Output Detail

- Document Types
 - Help
 - Description of each Class, its Attributes, Services and Population Selection Filters.
 - Full
 - Full description of a Conceptual Model
 - Aimed at analysts.
 - General
 - Description of each Class Attributes, Identification Function, Services, Aggregation Relationships and Specialization Relationships.

Output Detail

- Document Types
 - User Help Manual
 - Both Help Manual and Contextual Help (F1 key).
 - Intended for Operation Manual.
 - Integration with User Interface applications.
 - Project Report
 - Description of each Class Attributes and Services.
 - Test Report
 - Description of each Class Services.
 - Intended for Testing purposes.

Output Detail

- Document Formats
 - Multifile HTML
 - One HTML page per concept.
 - Recommended for navigable help.
 - Single File HTML
 - One single HTML page.
 - Recommended for printing.
 - ASCII Text
 - Single, plain ASCII text file.

Output Detail

- Document Formats
 - LaTeX
 - Single, LaTeX text file.
 - RTF
 - Single, RTF text file.
 - Compiled HTML
 - Same as Multifile HTML plus header files to be used by HTML Help Workshop compiler.
 - Recommended for contextual help.
 - Searching and Indexing facilities usage from browsers.

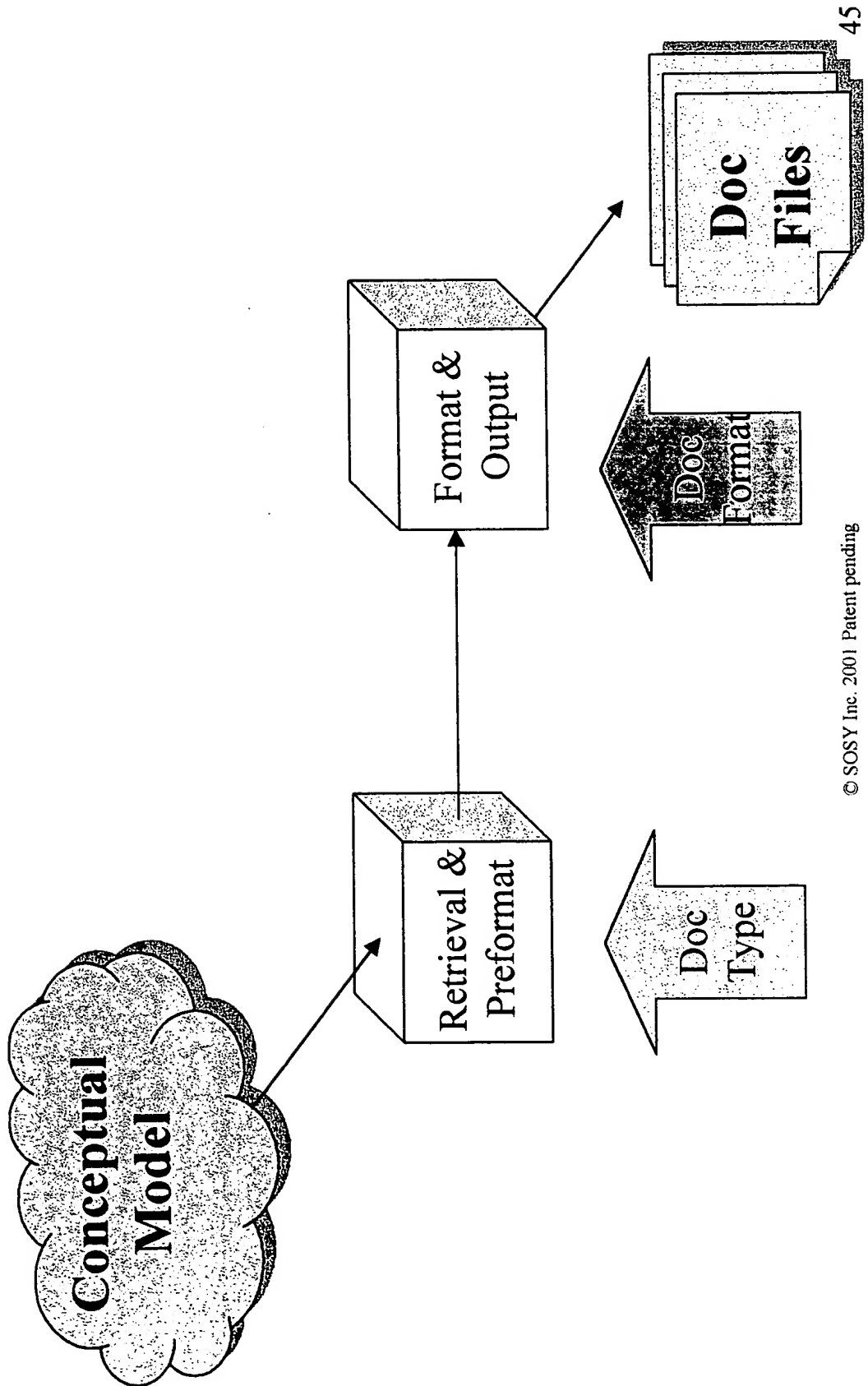
Translation

- Conceptual Model Subset of Interest
 - Subset of Interest depends on Document Type.
 - Usual elements:
 - Classes
 - Attributes
 - Relationships
 - Services & Arguments
 - Intensive use of analysis information.

Translation

- Translation Process
 - Read information from Conceptual Model and format it for output.
 - Two phases:
 - Information retrieval and pre-formatting.
 - Depends on Document Type
 - Independent from Document Format
 - Information output.
 - Depends on Document Format.
 - Independent from Document Type.

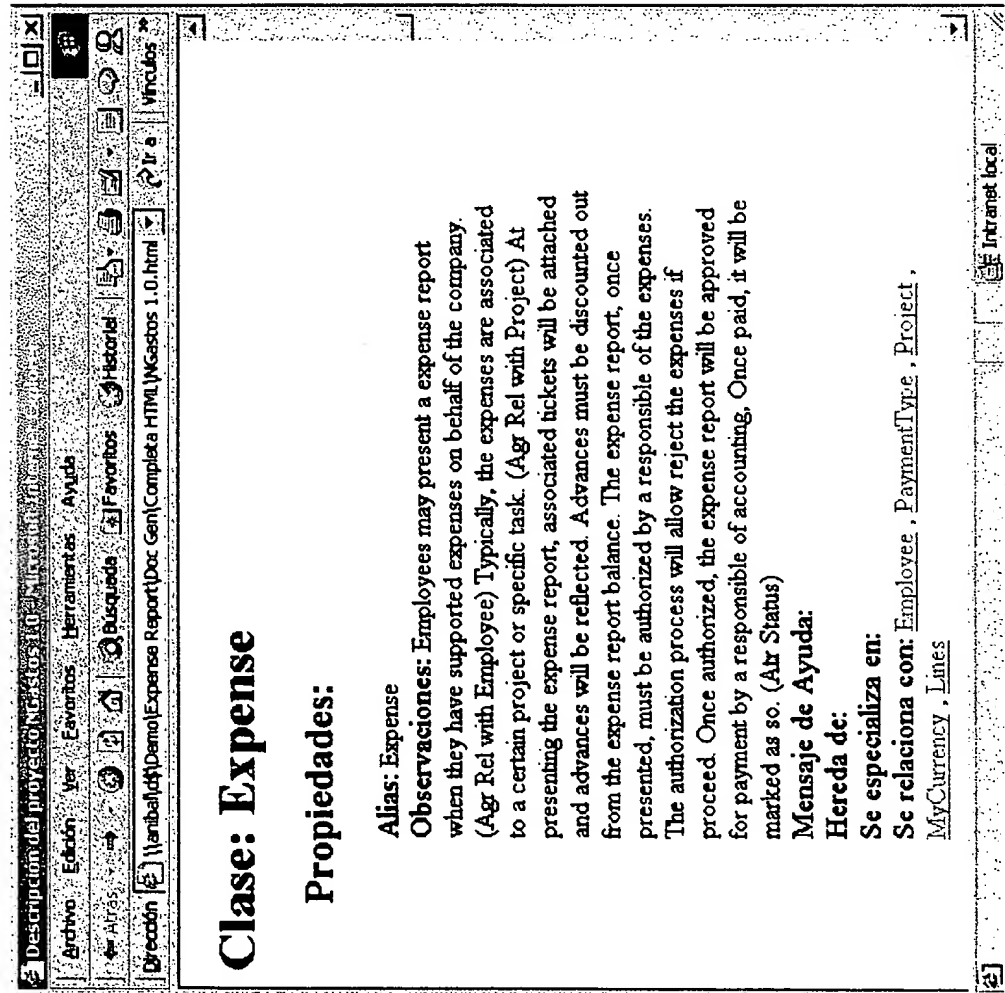
Translation Phases



Translation

- Remarks
 - Conceptual Model needs not to be valid (in terms of completeness and correctness) but it is always non-ambiguous.
 - The richer the analysis information, the richer the documentation.
 - Easily extensible
 - New Document Types
 - New Document Formats

Example



Persistence Relational Database Translation

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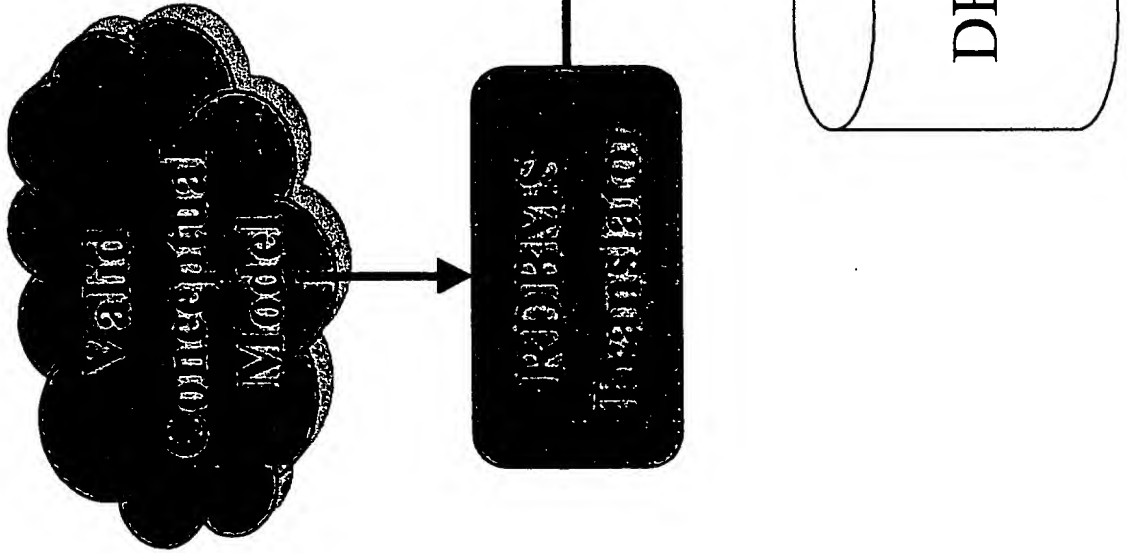
Index

- Intro
- Overview
- Output Detail
- Translation
 - CM Subset of Interest
 - Translation Processes
- Example

Intro

- Persistence Relational Database Translation is the process of creating a Relational Database from a certain subset of information in the Object Model of a valid Conceptual Model.
- Output script files are used to create a relational database using structured query language (SQL).

Overview



- Creates
- Primary Keys
- Foreign Keys
- Indexes
- Drop Creates
- Drop Primary Keys
- Drop Foreign Keys
- Drop Indexes

Output Detail

- **Creates**
 - Creation of Tables and Fields
- **Primary Keys**
 - Creation of Primary Keys as constraints on each table
- **Foreign Keys**
 - Creation of Foreign Keys as constraints on each table
- **Indexes**
 - Creation of Indexed on each table

Output Detail

- Drop Creates
 - Deletion of Tables
- Drop Primary Keys
 - Deletion of Primary Key Constraints
- Drop Foreign Keys
 - Deletion of Foreign Key Constraints
- Drop Indexes
 - Deletion of Indexes

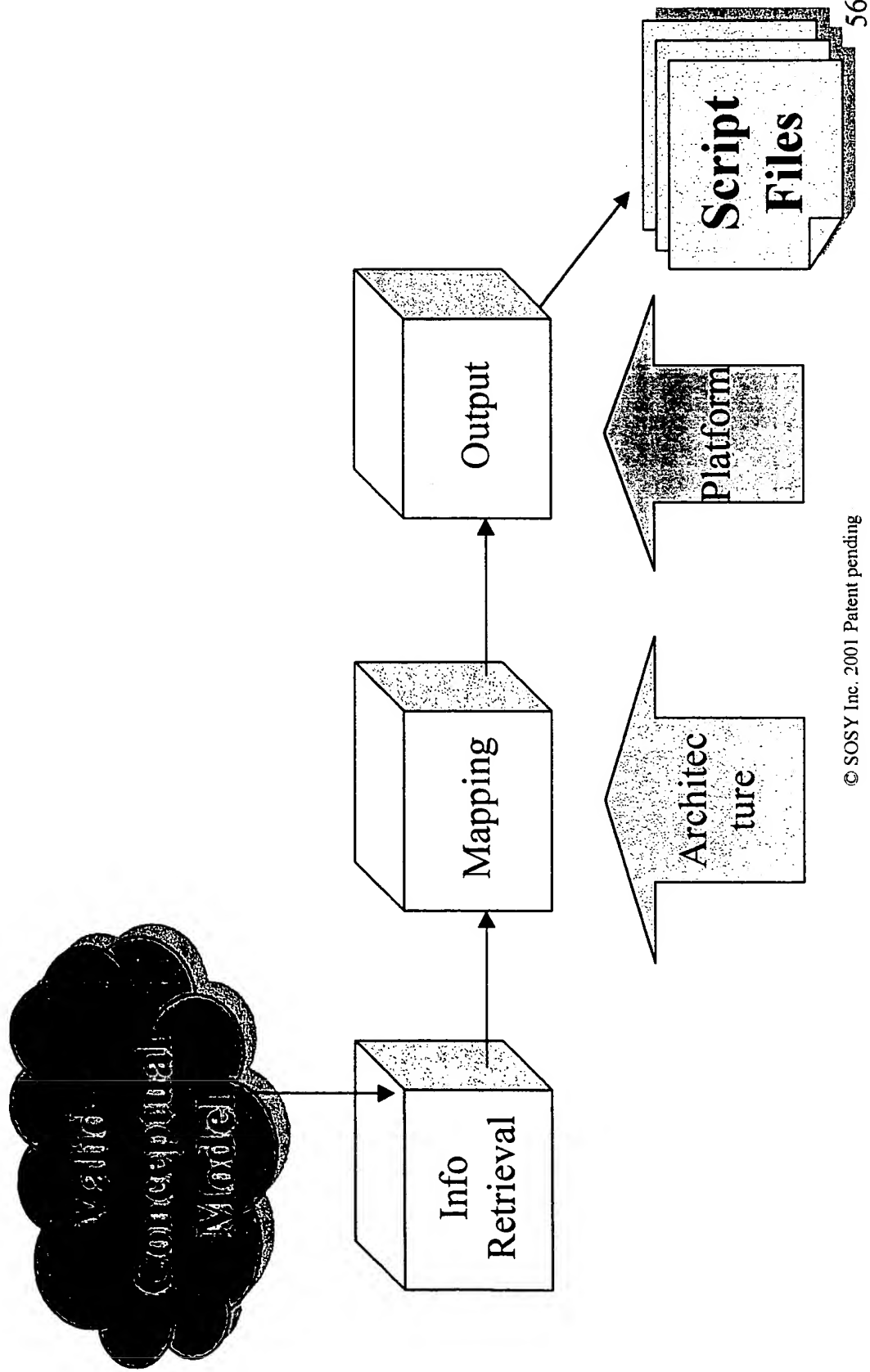
Translation

- Conceptual Model Subset of Interest
 - Object Model
 - Classes
 - Attributes
 - Identification Functions
 - Aggregation Relationships
 - Inheritance Relationships

Translation

- Three phases:
 - Information retrieval.
 - Independent from persistence architecture.
 - Fixed architecture mapping.
 - Depends on persistence architecture.
 - Information output.
 - Targeted for Standard ANSI SQL 92 RDBMS.
 - Script files depends on the platform's SQL syntax of RDBMS manufacturer.
 - May depend on platform specifications to make use of manufacturer extensions and tuning.

Translation Phases



Translation

- Translation Processes. Mapping:
 - Class \rightarrow Table
 - Non-derived Attribute \rightarrow Field
 - Identification Function \rightarrow Primary Key
 - Univaluated Relationship \rightarrow Foreign Key
 - Univaluated Relationship \rightarrow Index
 - Multivaluated Relationship \rightarrow Table
 - Inheritance Relationship \rightarrow Foreign Key

Example

Create table script in SQL for Expense class

```
CREATE TABLE Expense (
    fk_Project_1 int NOT NULL ,
    id_Expense int NOT NULL ,
    fk_Employee_1 CHAR(10) NOT NULL ,
    fk_MyCurrency_1 CHAR(5) NOT NULL ,
    fk_PaymentType_1 CHAR(5) NULL ,
    PresentDate datetime NOT NULL ,
    Status int NOT NULL ,
    Cause VARCHAR(255) NOT NULL ,
    AuthoDate datetime NULL ,
    AuthoComments VARCHAR(255) NULL ,
    PaymentDate datetime NULL ,
    PayComments VARCHAR(255) NULL ,
    Advances DECIMAL(19,6) NOT NULL ,
    Exchange DECIMAL(19,6) NOT NULL);
```

Business Logic Translation

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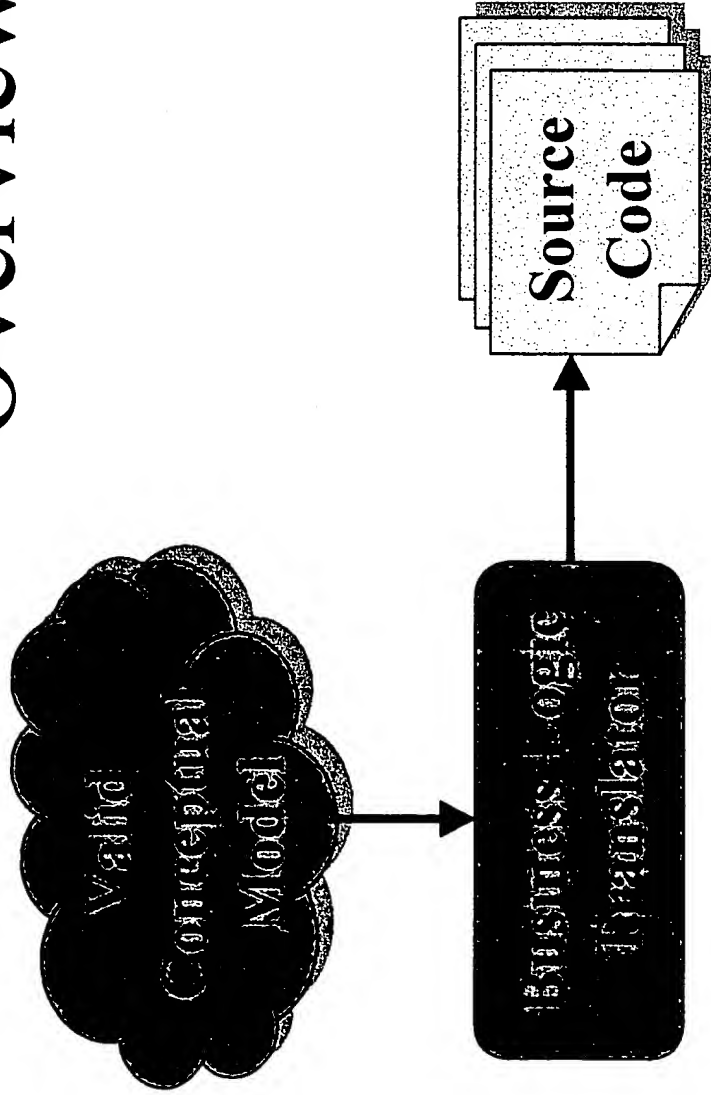
Index

- Intro
- Overview
- Output Detail
- Translation
 - CM Subset of Interest
 - Translation Processes
- Example

Intro

- Business Logic Translation is the process to obtain, following a precise Execution Model, the source code corresponding to the business logic from a valid Conceptual Model for a target Programming Language and Software Architecture.
- Execution Model is independent from Programming Language and Software Architecture.

Overview



Determines:

-Target Programming Language

-Target Software Architecture

Output Detail

- Target Programming Language and Software Architecture determine:
 - Source code organization in files
 - Files internal organization
- Source Code's backbone: Execution Model.

Output Detail

- Traceability: Source code highly readable and maintainable thanks to:
 - Source code is always organized and structured in the same way.
 - Naming conventions applied.
 - Source code includes analysis information from the Conceptual Model as comments.

Output Detail

- Implementation of a precise Execution Model grants Functional Equivalence with Conceptual Model.
- Programming Interface to Clients for:
 - Actor Validation and Authentication.
 - Services Execution.
 - Queries Execution.
- Manages:
 - Concurrency.
 - Transactions.
 - Interoperable Objects Persistence.

Translation

- Conceptual Model Subset of Interest
 - Object Model
 - Static properties (Visibility & Persistence)
 - Attributes + Identification Functions
 - Derivations
 - Aggregation Relationships
 - Inheritance Relationships
 - Services (Execution Model)
 - Arguments
 - Preconditions
 - Transaction Formulas
 - Actors (Execution Model)
 - Integrity Constraints (Execution Model)

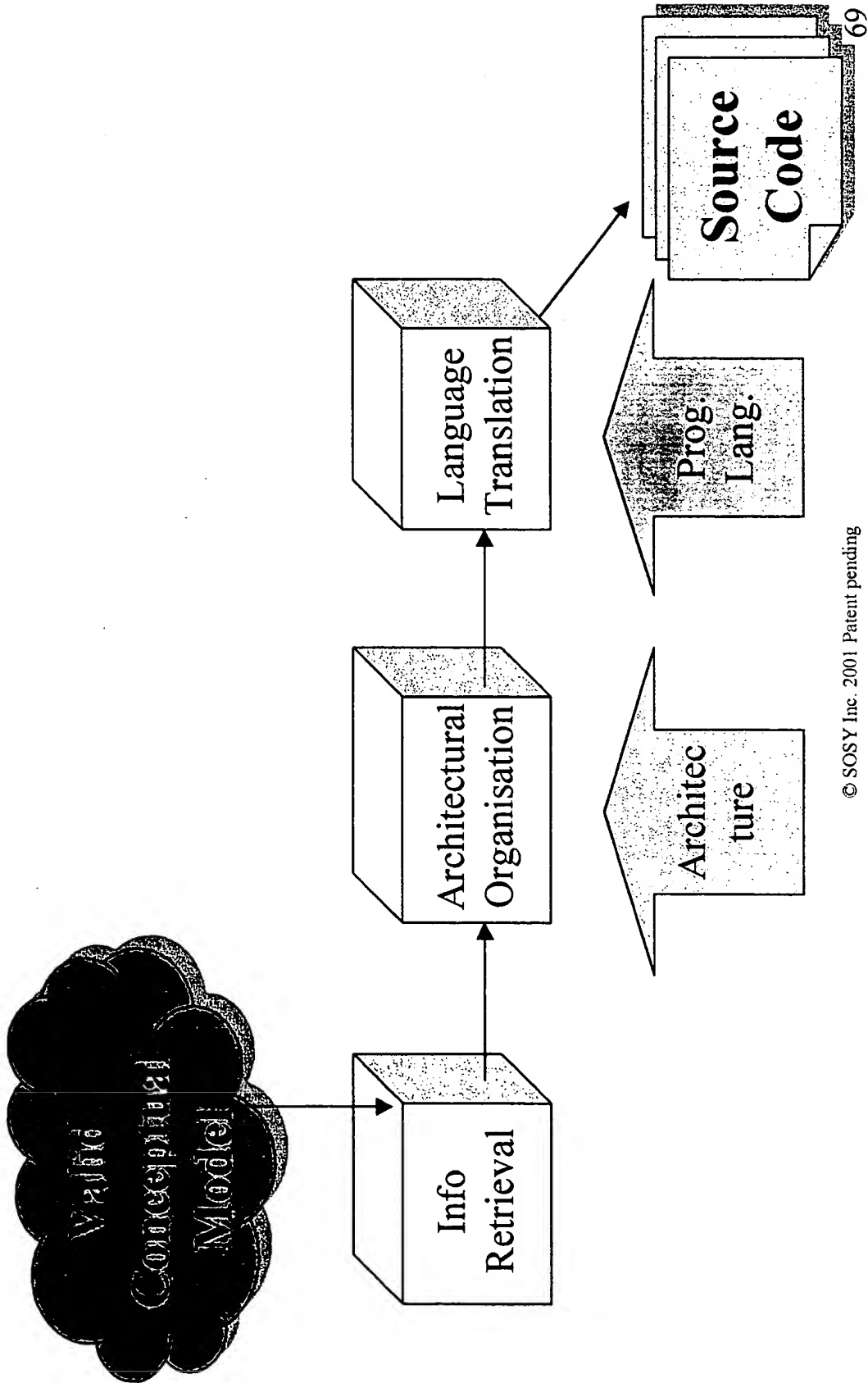
Translation

- Conceptual Model Subset of Interest.
 - Dynamic Model.
 - State Transition Diagram (Execution Model).
 - Controls Valid Lifes for an Object.
 - Object Interaction Diagram.
 - Triggers (Execution Model).
 - Global Transactions (Execution Model).
 - Functional Model (Execution Model).
 - Object state change upon occurrence of an event.

Translation

- Translation phases:
 - Information retrieval
 - Independent from target Software Architecture and Programming Language
 - Architectural organisation
 - Depends on target Software Architecture
 - Independent from target Programming Language
 - Determines files organisation and files internal structure
 - Language translation
 - Depends on target Programming Language
 - Influenced by Software Architecture
 - Takes advantage of Programming Language capabilities

Translation Phases



Translation

- Translation Processes
 - Classes
 - Static properties translation
 - Services translation
 - Queries translation
 - Global Interactions
 - Services translation
 - Global Functions
 - Functions Interface translation
 - Body is left blank

Example

- Evaluation:
 - Service Authorize modifies attributes Status, AuthoDate and AuthoComments
 - Formal Specification Language expression for evaluation Valuation
- [authorize ()] Status=2 and AuthoDate=today() and AuthoComments="";
- Visual Basic Produced

```
Private Function MV_Eval_Expense_authorize() As String
    Expense_Status = 2
    Expense_AuthoDate = today()
    Expense_AuthoComments = ""
    MV_Eval_Expense_authorize = ""
End Function
```

User Interface Translation

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